Doctor Hamilton's suggestion that the dose of serum should be about one-third that of whole blood is the generally accepted quantity. There is a tendency on the part of physicians to use too large a quantity of blood and too small a dose of convalescent serum. This latter tendency is probably accounted for by the fear some people have regarding the administration of serum in general.

This should not apply to a properly prepared homologous serum, which may be administered in adequate dosage, intramuscular or intravenous, and without fear, if the basic principles of such technique are observed.

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HYMAN I. VENER, M. D. (1531 Purdue Avenue, Los Angeles).—Doctor Hamilton rightly emphasizes the clinical indications and observations of immunotransfusions in communicable diseases. He has presented the subject from a practical bedside aspect as encountered in our daily hospital routine.

For years I have urged transfusions in the acute infections, often to the point of obsession. When transfusions were first instituted, normal healthy donors with high hemoglobin sufficed, but as our knowledge increased we supplemented this method with immunized donors, either from a recent convalescent or by the use of a vaccine, preferably of the autogenous type. Such a procedure is not only of definite value, but is also a worthy addition to our armamentarium of medical therapeutics. Transfusions, when administered properly, not only aid in overcoming severe toxemias and combating the resultant anemias, but very frequently are a life-saving measure.

If convalescent serum is not available, whole blood by direct method without typing, in small amounts of 15 to 20 cubic centimeters, may be given intramuscularly into one or both buttocks. Care must be taken to have a Wassermann-negative donor, unless one is certain, as may be the case when a parent is often used. This injection can be repeated at intervals as needed.

In cases of typhoid fever when we know the course of the disease will be protracted, active immunization of one or more normal, healthy donors can be started at a very early date. A vaccine of the autogenous type isolated from the patient—either from the blood stream, feces, or urine—would be preferable; but stock vaccine could be used. The dosage of vaccine can be calculated and given at four to five-day intervals for approximately two to three weeks, with a last dose being given about six to eight hours before the contemplated transfusion. Better yet would be the immunization of old, recovered cases, or those previously immunized with the triple typhoid vaccine. Such cases are expected to have a much higher antigen titer, and the results of the transfusion would be more satisfactory. Similar methods of treatment could be instituted for cases of long-drawn-out sepsis, such as streptococci and especially undulant fever.

Foshay, in a personal communication, believed that immunotransfusions might be effective in Brucella's infection. However, he felt that the donor should be a recovered patient and subjected to active vaccination rather than the use of a normal immunized donor. He calls the former type a hyperimmune status. Undoubtedly the serum or blood thus obtained has a tremendous potency and is of great therapeutic value. He firmly believes however, that it is necessary to vaccinate such a donor for at least a period of sixty days with daily injections in order to obtain good results. Foshay attributes the disappointing results obtained from normal immunized donors to the fact that they have not been immunized enough.

Some of the disappointing results of immunotransfusions can be traced to a rather hurried, active immunization with little consideration given to strains and specificities of the organism involved. Three weeks of active immunization is usually the maximum limit; often the period is much shorter. Consequently, the donor has not had sufficient time or antigen to call forth his greatest effort for high titer production.

As Foshay aptly states, "we send a new-born infant to do a man's work."

Halberg of Stockholm found that immunotransfusions gave surprisingly good results where simple whole blood had previously failed. He advocated the use of autogenous vaccine—one billion bacteria to a cubic centimeter—given at four to five-day intervals for three to four doses, and a final dose about six hours prior to the transfusion. Other workers advocate dosages of vaccine from 50 to 250 million per cubic centimeter at weekly intervals.

On a practical basis, it has been found that the bactericidal capacity of immunized donors gradually increases during the first six hours after the vaccine injection, and remains unaltered during the following forty-eight hours.

I believe that a donor, wherever possible, should be of the same blood-grouping and is preferable if choice is available. The reason is that the agglutinin content of the recipient is increased.

Transfusions cannot be relegated to a minor surgical technique. I am convinced that it is a major procedure, and infinite care and judgment must be used in the preparation of the patient, donor, and instruments. Attention to details and good teamwork in the procedure will save time and avoid the frequent delays. Moderately small doses of 150 to 200 cubic centimeters at frequent intervals in acute communicable or infectious diseases are of more decided value than one large transfusion of 500 cubic centimeters.

Transfusions cannot be supplanted by the various drugs, serums or vaccines advocated by different biological firms, despite their extravagant claims. Much of the reluctance in the use of transfusions by the profession may be ascribed to the fact that they do not have a product all wrapped up in a fancy package, and have not been deluged with reams of literature on the subject. Instead of making use of a transfusion *early* in the course of the disease, proprietary drugs are given, and when they fail to perform the miracles claimed, then transfusion is instituted. Under such circumstances the patient is either semimoribund or in extremely poor condition. It is no wonder, therefore, that many physicians do not believe transfusions have any value. It only serves to cast disrepute on such therapy. Certainly, it would be best not even to attempt transfusions and thereby save time, effort, and expense.

Finally, if immune transfusions are to be of value and have a fair degree of success, we must enlist the coöperation and teamwork of the clinician at the bedside and the bacteriologist in the laboratory. The latter must know the clinical history of the case and thereby be in a position to evaluate the causative organism and its special characteristics for isolation. A thorough understanding of the problem and a willingness to work together may be the deciding factor between success and failure. With this aim achieved, proper active immunization of the donor can be instituted with the consequent possible saving of a life realized in what otherwise may be a hopeless struggle.

PREMEDICATION FOR SURGERY*

By JAMES C. DOYLE, M.D.
Los Angeles

DISCUSSION *by Lawrence Chaffin, M. D., Los Angeles; H. N. Shaw, M.D., Los Angeles; Mary E. Botsford, M. D., San Francisco; Elmer Belt, M. D., Los Angeles.*

WHILE inhalation anesthetics are less than one hundred years old, as you all know, the use of drugs to produce sleep or stupor and facilitate surgery dates back many centuries. Soporific potions known to and used by ancient and primitive peoples included henbane, hashish, hemp, opium, and mandragora. In our own country, according to Stevenson,[1] certain Indian tribes used infusion of jimson weed (Datura stramonium). Drinking this they slept through crude operative procedures without a move or grimace.

REVIVAL OF AN ANCIENT ART

Today we are emulating these practices by the use of "potions" in the form of a barbiturate and a hypodermic. Although great strides have been recorded in anesthesia and surgery, I believe that the adequate preoperative preparation of the pa-

* Read before the Anesthesiology Section of the California Medical Association at the sixty-fifth annual session, Coronado, May 25-28, 1936.

tient has been in many cases grossly neglected. However, there is a more general appreciation of premedication just now than a few years ago. The day is passing when the patient is sent to surgery with only a hypodermic of morphin and atropin, and in many instances the patients themselves are asking for adequate premedication.

AUTHOR'S PERSONAL EXPERIENCE

Twelve years ago I had a major abdominal operation. I mention this only because I shall never forget the dread and fear that the inadequate preparation then in vogue did not alleviate. The night before I was given no sedative. A strange room, a different bed, thoughts of the morrow, and, in addition, a fire-alarm near by with the usual accompaniment of noise and confusion, were factors not conducive to slumber. Finally, at a late hour, after pacing the floor, reading, and counting sheep, I dozed off. The surgical preparation consisted of no breakfast and a hypodermic of morphin with atropin one-half hour before surgery. For some reason unknown to me the operation was postponed an hour; meanwhile the hypodermic had been given. The morphin, so far as I was concerned, served no purpose; the atropin, on the other hand, made me very dry and thirsty, for which there was no relief. As the minutes crept by, I was wide awake, anxious and apprehensive. Fear became predominant. There are countless thousands, I am sure, who feel as I do, and I bring this personal aspect to you because until very recently little or no thought has been given "adequate premedication" of the patient. Is it not surprising that even today some surgeons follow the course I have outlined?

PRESENT-DAY METHODS

At present there are available various preparations (drugs) that will entirely eliminate fear, worry, and even apprehension. Why are they not more generally advocated and used? Surely, it is not a question of safety. For the past six years, without any untoward reactions, I have given a barbiturate the night before, repeated it an hour before surgery, and fifteen minutes later administered a hypodermic of pantopan and scopolamin. No, it is not safety that deters premedication; it is probably no more than an old-established "habit."

MENTAL REACTION OF THE PATIENT

We have heard very little of the mental reactions of a patient about to have surgery; yet this factor, in fairness, cannot be overlooked. Some of us know of patients who died during induction. Recently I saw a patient wheeled into surgery for a traumatic lesion of the leg; the anesthetic was begun without even the preoperative "hypo"; the patient died after not more than half a dozen breaths of gas. What killed him? Many opinions were expressed. *I believe he died of fright.* The adrenals pour out their secretion excessively during fright—a powerful heart stimulant which may cause death.

Without adequate premedication patients are prone to shock and they require more anesthetic—25 to 50 per cent more in some cases. The majority spend a restless preoperative night. Upon arriving in the operating room they are apprehensive, worried, or excited, all of which contribute to poor anesthesia and a miserable convalescence.

A WORKING PROCEDURE

"Ideal" preparation, on the other hand, should include a barbiturate, preferably nembutol, the night before. For the average patient three grains is usually sufficient. One hour before surgery, nembutol, grains four and one-half, are given, and fifteen minutes later pantopon, grain one-third, or morphin sulphate, grain one-fourth, with scopolamin (ampoule), grain 1/150, by hypodermic. Thus, the patient secures a night of rest, free from apprehension and worry; in most instances will have no recollection of the trip to surgery or, if so, only a hazy one. Frequently he has no recollection of the first few days following operation. To illustrate how complete is the amnesia, patients often ask twelve to twenty-four hours following operation when they were going to surgery.

USE IN SUBARACHNOID BLOCK

The premedication routine just described is urgently recommended for subarachnoid block, and in all other cases where cocain or its derivatives are used. Barbiturates detoxify cocain and its derivatives: this is shown by the work of Tatum, Knoefel, and Guttman (quoted by Downs and Eddy),[2] and Swanson,[3] and many others. (The author stressed their use in 1932.)[4] Several years ago a prominent urologist told me of the behavior of many of his patients during sacral and spinal analgesia: immediately following the injection of novocain they would become pale, the blood pressure would drop, the pulse become rapid and thready, the body surface would be clammy and wet; the whole picture was that of cardiovascular collapse, in other words shock. I suggested that he use a barbiturate preliminarily, and he has done so, with the result that to date the above-mentioned sequelae have been eliminated. Many patients, sensitive to cocain or its derivatives, must be fortified against these undesirable sequelae. It is my belief that many of the sudden deaths reported due to "spinal" are, as a matter of fact, novocain poisoning or sensitivity. Other sequelae and complications reported, such as extraocular palsies, neuritis, headaches, spinal-cord degeneration, etc., may be obviated by the use of barbiturates.

In addition to the preliminary medication already mentioned for subarachnoid block, ephedrin grain three-quarter, is given when the patient leaves the room for surgery. When given ten to fifteen minutes preceding the block, this drug, by its action on the smooth muscle, causes a moderate rise in blood pressure of 10 to 30 millimeters. Ferguson and North[5] experimentally established that there was no drop in blood pressure following its usage. Personally, from a clinical aspect, there is a moderate and gradual drop, depending on the level of analgesia desired and the condition of the vascular tree. In other words, on a patient

with a marked generalized arteriosclerosis, ephedrin would have much less effect than on one with little or no sclerosis.

COMPOUNDS OF BARBITURIC ACID

The barbiturates first came into use in 1903 after Fischer and Mehring[6] synthesized "veronal." Since then many new compounds of barbituric acid have been produced and used as basal narcotics, also at times as anesthetics. Included in this group are luminal, somnifain, dial, neonal, allonal, amytal, pernocton, sodium amytal, and nembutol. Much has been written about these last two preparations, nembutol and sodium amytal; their popularity has reached the point where their use in some clinics and hospitals is almost routine. They are derivatives of barbituric acid, depressing the sensory and intellectual processes, and act by diminishing the proprioceptive faculties, thereby favoring sleep. They are sedative, antispasmodic, and hypnotic. The effect is prompt, and dreamless sleep is secured within twenty to thirty minutes following oral administration. When combined with morphin sulphate and scopolamin, body functions are altered but slightly. The blood pressure drops 10 to 30 millimeters, the pulse rate decreases and respiration is slowed. The barbiturates are broken up by the liver, and thought to be excreted through the lungs. In the instance of nembutol and sodium amytal they are not recovered in the urine.

ADVANTAGES OF THE BARBITURATES

I have mentioned some of the benefits afforded by this group (of which nembutol and sodium amytal are by far the most popular), benefits providing the patient with a restful night and amnesia on the day of surgery. Furthermore, they lessen the amount of anesthetic needed. Other favorable factors are the elimination of the excitement stage of the anesthetic; a favorable impression on the part of patients having had previous surgical experiences; a decrease in postoperative pulmonary complications (Hooper and Gwathmey).[7] Gwathmey[8] also stated that their preoperative use reduced by 28 per cent the use of morphin sulphate postoperatively, and by 15 per cent the incidence of vomiting as compared with the usual preliminary of morphin sulphate, which requires 82 per cent postoperative morphin and results in 60 per cent vomiting. The combination of nembutol with morphin sulphate and scopolamin has proved efficacious: the one fortifies the other and the tranquillization produced is greater than when one is given without the other. Respiratory depression is greater, but is slight as compared with the increased efficiency obtained. Clinical and experimental evidence, substantiated by personal experience, has led the author to use nembutol almost exclusively.

PHARMACOLOGY OF PREMEDICATION DRUGS

The pharmacology of the premedication drugs, I am sure, is well known to you all. A few points may, however, be mentioned. *Morphin and pantopon* are similar in action. They differ in that the latter consists of the isolated alkaloids of opium in their natural proportions, the gums and resins being absent, thus assuring prompter absorption. Both act on the central nervous system, depressing its higher functions. The cardiovascular and respiratory systems are slightly depressed. The latter (pantopon) is less likely to cause nausea and vomiting, and tends to be less constipating. Both are broken up in the liver and partially destroyed there, while a smaller part is eliminated in the urine and feces. When combined with scopolamin and the barbiturates they are synergistic, and aid each other in producing more satisfactory tranquillization.

Scopolamin and atropin are similar in that both are alkaloids. The former occurs in various plants containing atropin and is now prepared mainly from scopola. The latter is derived from a number of plants, such as belladonna, scopola, etc. It is a respiratory stimulant. Both dilate the pupil; both suppress secretions of the salivary, sweat and mucous glands, the former being the more powerful in this respect. Because of its stability the ampoule form of scopolamin is recommended. In this form the dextro-rotatory, or stimulating alkaloids. have been removed, leaving only the levorotatory, or sedative alkaloids.[9] I have never seen a deleterious reaction from the ampoule, while unfavorable sequelae are not infrequent when the tablets are used. There is an antipathy in the minds of some men regarding the use of scopolamin, and rightly so. An elder colleague informed me of a death due to 1/75 grain (tablet) many years ago. It is needless to say he never used it again, but this was before the time of the ampoule; besides, the need for so large a dose rarely, if ever, arises.

I have previously stated my usual recommendations for preoperative drugs. I may go so far as to say they are almost routine. There are, of course, reservations as to age, weight, general condition, and to some extent the type of anesthetic, but for subarachnoid block, nitrous oxid, oxygen and ether I follow the outline above. Exceptions relate to avertin and evipal and children.

Because *avertin* (tribrom ethanol) is a powerful respiratory depressant, the preliminary medication should be somewhat less. The evening before the usual nembutol, grains three, is recommended (except in the aged and cachectic when one and one-half grains are sufficient. One hour before surgery nembutol, grains three, is given, and it is followed fifteen minutes later by a hypodermic of morphin sulphate, grain one-quarter or one-sixth, and atropin sulphate, grain 1/150. The avertin is then instilled rectally about twenty to thirty minutes before surgery. No ill effects have been noted with the above method, nor has respiratory embarrassment been encountered.

In cases where evipal is to be used, the question of premedication depends upon whether or not the patient is hospitalized and also upon the operative procedure employed. *For out-patients premedication is not recommended.* For in-patients morphin sulphate or pantopon with scopolamin will suffice, and to some extent lengthen the anesthesia; post-

operative comfort, too, will be assured. From evipal alone patients generally recover rapidly with no untoward reaction. It is only when large doses of a barbiturate are used that the reaction is delayed. In itself the drug is a cardiovascular, respiratory depressant; and the addition of nembutol or amytal increases this action unduly. It is a splendid anesthetic for operations of short duration.

SURGICAL PREMEDICATION FOR CHILDREN AND INFANTS

Of late some progress has been made in preparing the adolescent and adult for surgery. Children and infants have been woefully neglected. I wonder how many of us would be willing to undergo surgery with no premedication whatsoever? I feel quite sure of the answer! We know that infants and children tolerate medication. Jarman[10] has advocated and used nembutol in children successfully and without a failure in over two hundred cases by rectal administration. Leech,[11] in a still larger series of cases, recommends morphin, sulphate and scopolamin from two years on, and has used hyoscin, grain 1/1200 or 1/900, in infants with pyloric stenosis. His schedule begins at one year, with morphin sulphate grain 1/40, hyoscin grain 1/600, forty-five minutes before surgery, and proceeds up to twelve years, with morphin sulphate grain 1/12, hyoscin grain 1/300.

As with adults, we pay no heed to the psychic effects of surgery on these children, yet we know that the child *is* afraid of a hospital and of an operating room. Should they not be permitted to face the ordeal of a surgical experience with the same tranquillity as their elders? The induction is usually associated with crying and exhibitions of physical prowess, and undoubtedly a sequel to this terrifying experience is manifested by their fear during future contacts with the medical and nursing professions. This fact is substantiated by reports from numerous children's clinics, nurses, and social workers.

How, then, shall we aid these children? The answer is quite simple: nembutol plus atropin for the infants, with the addition of morphin in older children. How much shall we give them? No routine will apply here because of the prevalent variations in age, weight, and general condition. However, for a child of roundly four years, grain one of nembutol the night before and grains one and one-half one hour before surgery. If not asleep in thirty minutes, another grain may be instilled in the rectum. Subsequently a hypodermic of atropin, grain 1/450, forty-five minutes before surgery. In older or younger children, the doses will vary correspondingly.

I have seen no untoward reactions from this treatment, and the children were sleepy or asleep when they arrived in surgery. The induction was smooth and quiet; the anesthetic dosage was appreciably lessened. The children, I feel sure, have had no visions of terror or fright, no memory of the mask or ether, and their future medical care will be simplified with better and happier coöperation.

COMPLICATIONS

Complications, sequelae, or untoward reactions are infrequent, but do occur. This fact necessitates careful watching on the part of the anesthetist and nursing staff. As an example, occasionally a patient having had a preliminary barbiturate may get out of bed on the first or second day postoperatively. Although the incidence of this somnambulance is low, and more of a rarity with nembutol than sodium amytal, it should be guarded against by side boards routinely. It is noteworthy that none of these patients had to be reoperated for hernias or eviserations. Some few patients do not react favorably to the barbiturates and are hyperactive postoperatively. These need closer observation on the part of the nursing staff. Morphin sulphate or pantopon usually controls them. Cyanosis of lips, associated with a cardiorespiratory depression, is usually of brief duration. Carbon dioxid or carbogen inhalations twice daily or three times a day may serve to prevent lung complications, and should be used routinely when ether has been given for a long operation. Rarely postoperative narcosis lasts several days, but causes no untoward result.

IN CONCLUSION

In an experience of six years there have been no fatalities or unfavorable sequelae from "adequate premedication." Nembutol grains three the night before with nembutol grains four and one-half one hour before surgery and pantopon grain one-third, or morphin sulphate grain one-quarter, with scopolamin (ampoule) grain 1/150 forty-five minutes before surgery (with variations for age, weight, and general condition of the patient), have proved satisfactory for all concerned—patient, anesthetist, and surgeon.

This combination was productive of amnesia, tranquillization, and a notable absence of fear and apprehension for the patient. The anesthetist found the induction easier and the anesthetic dosage was reduced by 25 to 50 per cent. When subarachnoid block was used, the patients slept throughout and no untoward reactions or sequelae occurred. Premedication for children is humane; it is desirable from the standpoint of the family, the anesthetist and the surgeon. Last of all, adequate premedication aids convalescence by decreasing the postoperative use of morphin and materially lessening lung complications.

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DISCUSSION

LAWRENCE CHAFFIN, M. D. (1136 West Sixth Street, Los Angeles).—The value of adequate preoperative medication cannot be overestimated. The demand for more satisfactory preoperative medication in all types of surgery has been answered during the past five years by the general use of the barbiturates. Experience has clearly proved that preoperative barbiturates, in addition to the usual morphin and scopolamin, are of definite practical value, and for the following reasons:

1. Fear is so completely eliminated that many patients do not remember having had their operation.
2. The safety of spinal anesthesia is materially increased.
3. The amount of general anesthesia required is definitely lessened.
4. All types of anesthesia are taken smoothly and without effort.

I have found the procedure outlined by Doctor Doyle to be efficient and satisfactory in all respects. I would, however, suggest caution in the dosage of barbiturates for those past sixty, and for those patients who have had a prolonged illness. It has been my experience, likewise, that not infrequently children under three years of age are rather sensitive to nembutal, and require careful dosage.

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H. N. SHAW, M.D. (901 Pacific Mutual Building, Los Angeles).—This paper emphasizes a very important point: the necessity for close coöperation between the anesthetist and the surgeon.

A careful study of the patient by the anesthetist, with suggestions as to the type of anesthetic, takes quite a load from the surgeon's mind.

Among our surgical patients, a good number had previous operations before proper attention was paid to the preoperative medication. These individuals never fail to express their appreciation of its value. As the author points out, the strain which the patient undergoes before the ordeal of surgery may be a considerable factor in a delayed convalescence.

In 1908 I was operated for an empyema. As far as I was concerned, that rib resection was the most important operation that had been performed anywhere for several years. I can never forget the trip to the operating room, through walls redolent of iodoform. A crowning humiliation was to hear one of three or four white-clad figures say, "Here's the next case, who's going to put him on the table?"

A surgeon, who has recently returned from a tour of the large eastern clinics, told me that in many of them they pay very little attention to surgical premedication. It is, however, an extremely important part of the surgical procedure, and I wish to compliment the author on his very clear presentation of the subject.

❦

MARY E. BOTSFORD, M. D. (807 Francisco Street, San Francisco).—This timely paper is on a subject that, for some years past, needed to be brought to the attention of the medical profession. The routine administration of morphin and atropin militates against the best results, preoperatively and postoperatively, with a large percentage of patients.

The psychologic factor is of the utmost importance in the adult patient and, as Doctor Doyle points out, doubly so in children, as the sights and sounds of transportation to, and a possible long period of waiting in, the surgery may produce a psychic response which has been known to lead to a complex lasting for years. The addition of the barbiturates and tribromethanol to the previously known narcotics, such as the opium derivatives and scopolamin, have helped immeasurably in providing an escape from the depressing effect of fear, and in bringing the patient to the operating table in the best possible physiologic and psychologic condition.

The selection and combination of hypnotics and anesthetics must vary with the individual condition.

The use of atropin in combination with morphin was based on the tradition which still maintains, that being the physiologic antagonist of morphin, it provides a safety factor. It stimulates respiration, accelerates the heart, and increases the metabolic rate. This respiratory action is a disadvantage in modern gas anesthesia, and now that carbon dioxid is available in all well-equipped operating rooms, respiratory depression can be immediately overcome.

All of the arguments of the psychic and physiologic values of the methods advocated in this paper for inhalation anesthesia have double force as to their use with subarachnoid. Finally, the barbiturates have been proved to decrease the toxicity of the cocain derivatives.

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ELMER BELT, M. D. (1893 Wilshire Boulevard, Los Angeles).—Dr. James Doyle is to be commended for his vigorous and pleasing style of writing, as well as the presentation of a very usable plan of surgical premedication. With the magic of the phenobarbital group of drugs at hand, there remains little excuse for permitting the occurrence of preoperative terrors and fatiguing worry. I vividly recall an old gentleman driven to seek surgical help because of severe urinary hemorrhage. Fear of his hemorrhage outweighed his fear of surgery. Entering the hospital late at night, he refused all medication and suddenly fled when an orderly came in to shave his pubes. The next day another hemorrhage occurred. He reëntered the hospital, still vowing that he would not be drugged. He permitted the nurse to give him an enema and thus received nembutal by rectum. When he awakened, the papilloma, which had caused his trouble, had been removed. He is now friendly to hospitals and laughs at his former fears.

Doctor Doyle fails to mention a powerful factor in his success as an anesthetist. This is his custom of visiting and examining the patient on the day before surgery. This contact is comforting and reassuring to the patient. It gives him an opportunity to express his fears and have fear replaced by a rational understanding of the manner in which a scientific man is prepared to meet for him the problem of anesthesia.

URETERAL CALCULI*

By DOZIER H. GIBBS, M.D.
Los Angeles

DISCUSSION *by Burnett Wright, M. D., Los Angeles; A. A. Kutzmann, M. D., Los Angeles; Lionel P. Player, M. D., San Francisco.*

AS this paper deals with the practical management of ureteral calculi, the question of etiology of urinary lithiasis will be only briefly mentioned.

ETIOLOGY

The primary cause is unknown, and it remains for the physical chemists to solve the problem. When they discover the cause of the disturbed colloid crystalloid balance, the question will be nearer a solution. Urinary stasis; infections, local and focal; disturbances of metabolism, especially calcium; vitamin A deficiency; trauma of the kid-

* Read before the Urology Section of the California Medical Association at the sixty-fifth annual session, Coronado, May 25 to 28, 1936.